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Ministry of Environment

A COMPARISON OF THE 1941-1970 AND 1951-1980 CLIMATOLOGICAL NORMALS FOR BRITISH COLUMBIA

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WORKING REPORT

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TABLE OF CONTENTS

		Page
I.	INTRODUCTION	1
II.	ANALYSIS	1
III.	DISCUSSION	2
IV.	SUMMARY	3
	REFERENCES	5

LIST OF FIGURES

Figure		
1	Comparison of the 1941-1970 and the 1951-1980 Annual Temperature Normals	6
2	Comparison of the 1941-1970 and the 1951-1980 Mean Annual Precipitation in British Columbia	7
3	Annual Normal Temperature Differences	8
4	Annual Normal Precipitation Differences	9

A COMPARISON OF THE 1941-1970 AND 1951-1980 CLIMATOLOGICAL NORMALS FOR BRITISH COLUMBIA

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I. INTRODUCTION

One way of expressing the climate of an area is to use the arithmetic average of a series of observations made over a number of years. The length of observational record that results in a fairly stable average called "normals", varies depending on the area under consideration; mountainous areas require longer periods than do the prairies. In order to provide a common reference to facilitate the comparison of climates, the World Meteorological Organization (WMO) recommended the use of the most recent 30-year period starting on January 1 of the year ending with the digit 1 (for example 1921-1950) and recommended that these standard normals should be recomputed each decade, i.e. at the end of 1960, 1970 etc. (Jaganathan, et al., 1967).

The purpose of this article is to compare the temperature and precipitation normals derived from the 1941-1970 period (Atmospheric Environment Service, 1972) and the 1951-1980 period (Atmospheric Environment Service, 1982) for key sites in British Columbia with good, long-term climatological records.

II. ANALYSIS

Climatological stations which have 30 complete years of records (Type 1 normal in AES Normals book) were used in determining the 1941-1970 and 1951-1980 temperature and precipitation normals. Thirty-six such stations were used in the analysis of temperature normals; 37 for annual and seasonal precipitation, and 30 for the comparison of the number of days with measurable precipitation.

The mean annual temperature for both 30-year periods were compared and plotted as shown in Figure 1. Similarly, a plot of the annual precipitation is shown in Figure 2.

III. DISCUSSION

The average difference between the normal mean temperatures of the two 30-year periods amounts to 0.06°C; the 1951-1980 normals being slightly lower. The biggest difference of 0.3°C is exhibited at Big Creek, while six sites have a difference of 0.2°C. The closeness of the two normals is also demonstrated in Figure 1 with most points lying close to the 1:1 line. There are seven sites where the 1951-1980 normal is higher than the 1941-1970 (Figure 3).

When the sites are differentiated into coastal and interior areas, the coastal area (15 stations) exhibits an even smaller difference between normals (0.04°C); 1951-1980 again being colder.

The normal annual precipitation (Figure 2) differs by 40.1 mm on the average; 1951-1980 having the greater annual precipitation. This difference amounts to 3.1 percent more than the 1941-1970 normals. For the coastal sites (21 stations), the difference is larger (60 mm) but still amounts to 3 percent more than the 1941-1970 normals. There are eight sites out of 37 where the 1951-1980 annual precipitation normals are slightly less than the 1941-1970 normals (Figure 4). On sites which are wetter in the 1951-1980, the differences are substantial; the biggest difference amounts to 140 mm exhibited at Bull Harbour located off the northern tip of Vancouver Island.

The 1951-1980 mean maximum temperature is lower by 0.15°C than the 1941-1970 value. This is reflected in the mean daily temperature comparison as discussed above. The mean minimum temperature, however, presents a very interesting trend. It turns out that the minimum temperatures in 1951-1980 are higher than those of the 1941-1970 normals by as much as 0.05°C.

The temporal changes in temperature and precipitation demonstrate a very interesting fundamental relationship. Since precipitation is higher, the land surface is consequentially moister in 1951-1980 than in 1941-1970. This led to more energy being used for latent evaporation than for heating the air (sensible heat) therefore, the maximum temperature which normally occurs during the latter part of the day was not as high as in 1941-1970. The minimum temperature, which normally occurs late at night or early morning, was not as low as in 1941-1970 due to the presence of more moisture, i.e. the surface being moister cools more slowly than would the relatively drier surface of 1941-1970. A similar direction of change is exhibited during the growing season (May-September) for both elements. The difference in temperature amounts to 0.08°C, 1951-1980 being cooler. The May-September precipitation differs by 14.8 mm, 1951-1980 being wetter, and is 4.8 percent higher than the 1941-1970 normal.

As expected there are 3.4 more days with measurable precipitation for the year in 1951-1980 period, while there are 2.3 more days with precipitation in May-September.

All the differences described above are attributed to the difference in the provincial climate in the decades 1941-1950 and 1971-1980. It is implied in all the above discussions that the 1971-1980 period is slightly cooler and slightly wetter than that of 1941-1950.

IV. SUMMARY

A comparison of the 1941-1970 and 1951-1980 temperature and precipitation normals for several sites in British Columbia showed that 1951-1980 is cooler by 0.06°C for the year and 40 mm wetter for the year. There are three more days with measurable precipitation annually in the 1951-1980 period. A similar magnitude of differences are exhibited if the May-September period is considered. Also the coastal area showed the same pattern of change as the interior (continental) region.

The cooler climate in the 1951-1980 period is interrelated with a slight increase in precipitation. It is speculated that the slightly wetter surface conditions resulted in lower day time maximum temperatures since relatively more energy was used for latent heat than for the heating of the air (sensible heat). Interestingly, the wetter surface resulted in higher night time minimum temperatures since moisture retarded the cooling process. This effect turned out to be much smaller than the change in the maximum temperature and the net effect was a slightly cooler regime over the 1951-1980 period.

The differences noted in this analysis reflect the cooler and wetter climate of the 1971-1980 decade as compared to that of 1941-1950.

It is hoped that these findings will serve as a guide in interpreting the climates of the Province which have been characterized previously using the 1941-1970 normals.

REFERENCES

Atmospheric Environment Service. 1972. Temperature and Precipitation 1941-1970. British Columbia. Environment Canada, Downsview, Ontario. 94 pp.

Atmospheric Environment Service. 1982. Canadian Climate Normals, Temperature and Precipitation (1951-1980). British Columbia, Environment Canada. 268 pp.

Jaganathan, P., R. Arlery, Ten Kate, H. and M.V. Zavarina. 1967. A Note on Climatological Normals. WMO Technical Note No. 84 (WMO-No. 208.TP.108). Geneva, Switzerland. 19 pp.

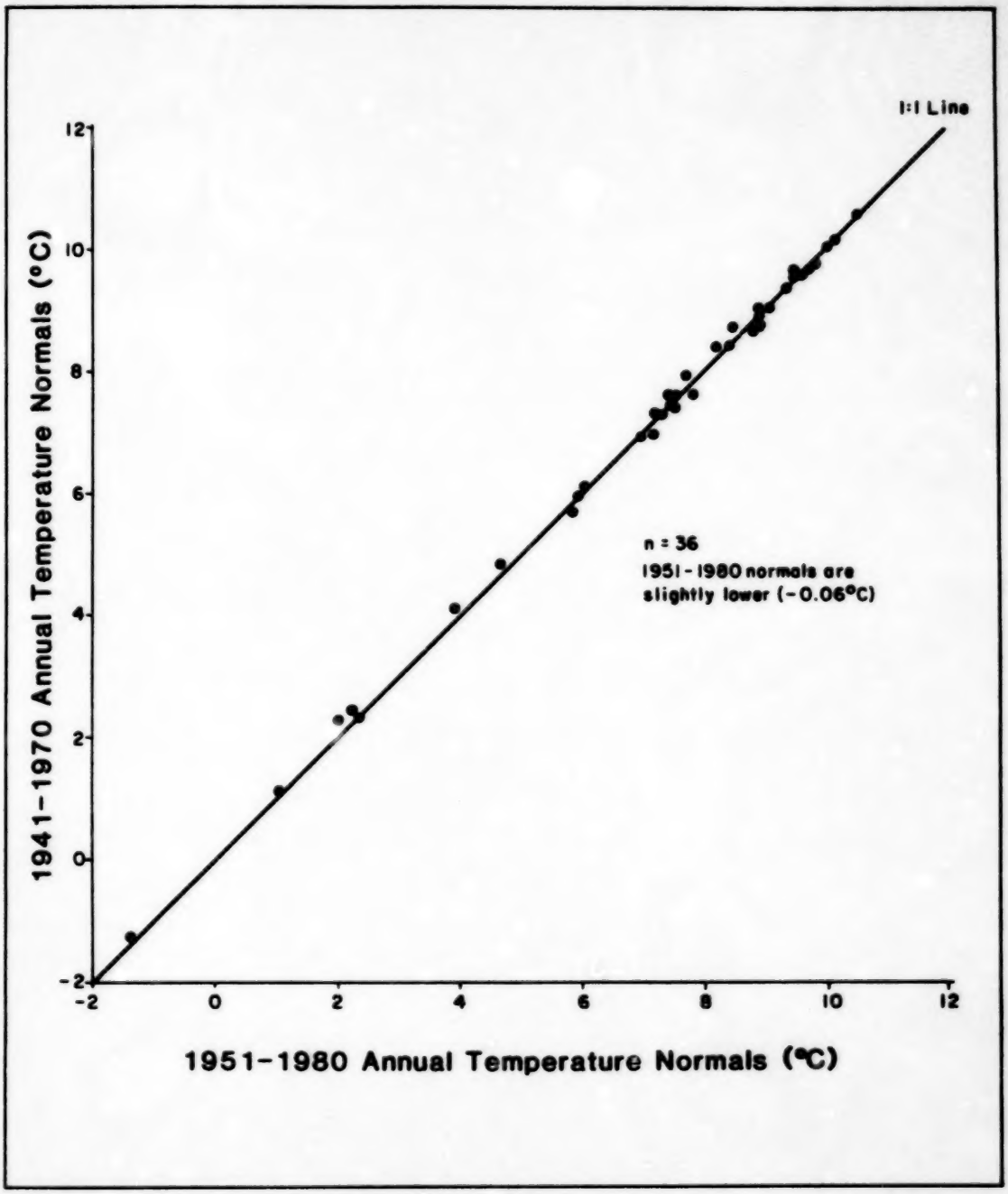


Figure 1 Comparison of the 1941-1970 and 1951-1980 annual temperature normals.

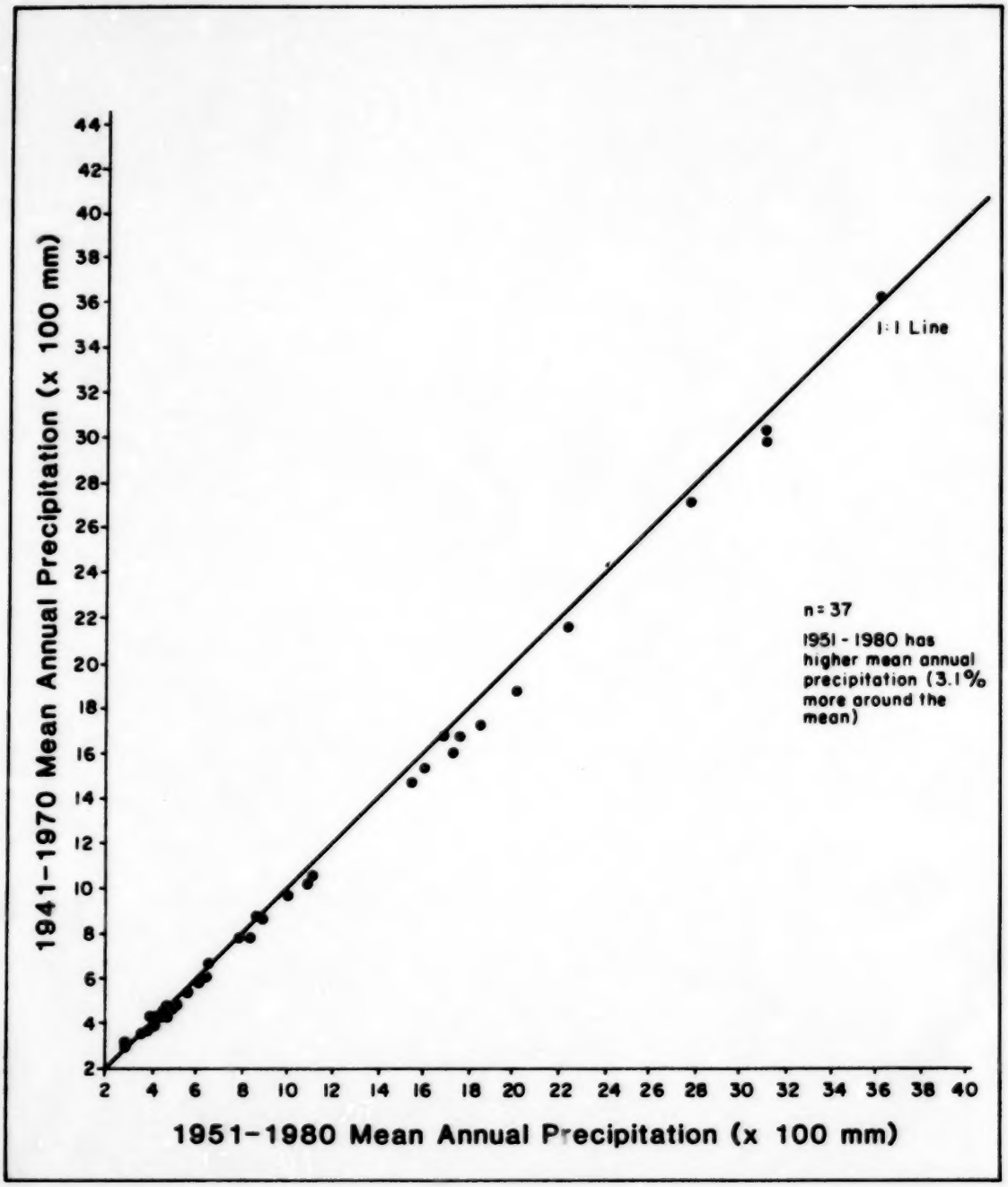
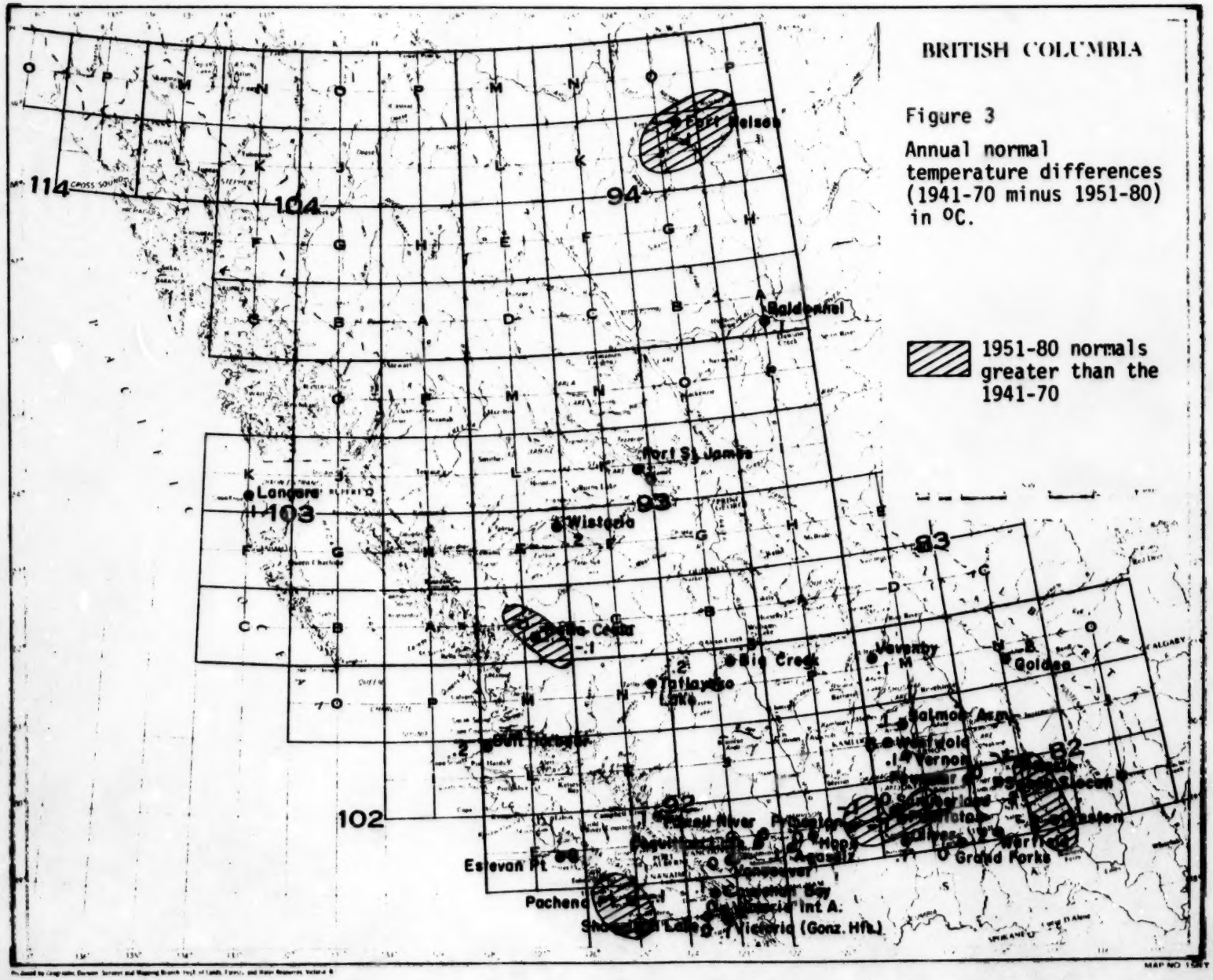
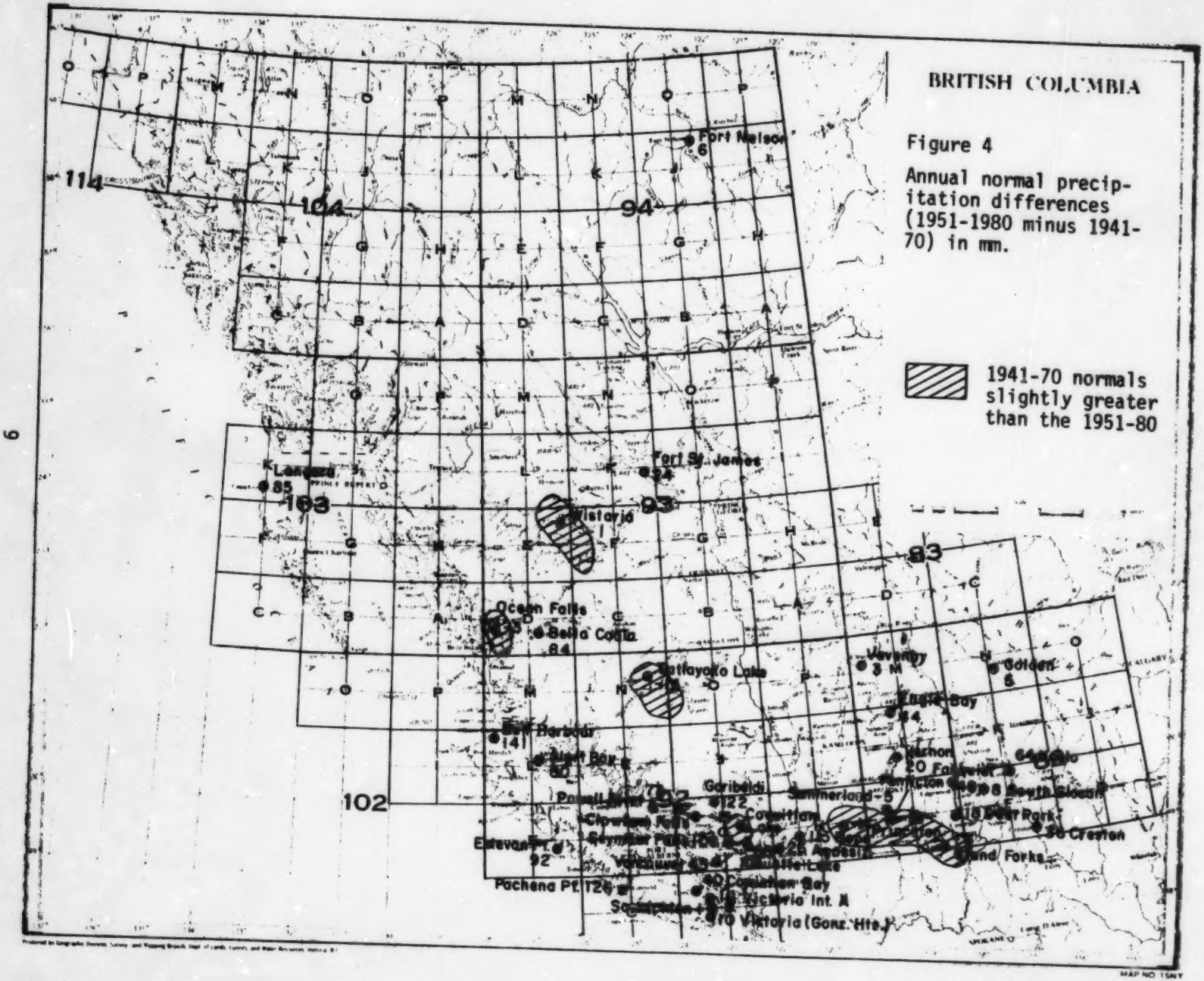


Figure 2 Comparison of the 1941-1970 and the 1951-1980 mean annual precipitation in British Columbia.


BRITISH COLUMBIA
Figure 3
Annual normal temperature differences (1941-70 minus 1951-80) in °C.
1951-80 normals greater than the 1941-70
114
104
94
103
93
83
102
82
Fort Nelson
Baldonnel
Fort St. James
Langara
Wistaria
Prince George
Big Creek
Vanderhoof
Vernon
Penticton
Grand Forks
Trail
Nelson
Cranbrook
Hope
Agassiz
Vancouver
Esquimalt
Victoria (Gonz. Hts.)
Pachena Point
Estevan Pt.


BRITISH COLUMBIA
Figure 4
Annual normal precipitation differences (1951-1980 minus 1941-70) in mm.
1941-70 normals slightly greater than the 1951-80
Fort Nelson
Fort St. James
Victoria
Ocean Falls
Bella Coola
Williams Lake
Vavenby
Golden
Eagle Bay
Summerland
Penticton
Grand Forks
Pachena Pt.
Victoria Int. A
Victoria (Gonz. Hts.)
114
104
94
103
93
102
92
MAP NO 1 SNY